Threat Appraisal and Infection Preventive Behaviours among Poultry Farm Workers in Ibadan, Nigeria

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Abstract: Infectious diseases are the most important cause of deaths in both the developed and developing countries. The situation in developing countries like Nigeria is more pathetic, due to the typical characteristics of its poorer population which is conducive to the evolution of infectious organisms. Certain sub-groups of the population, like poultry farm workers are worst hit by the plague of infectious organisms. Hence, perceived severity of and vulnerability to infection as well as infection preventive behaviours are assessed among livestock farm workers in Ibadan, Nigeria. One hundred and sixty-eight structured questionnaires administered via snowballing yielded data whose analyses revealed bipolar distribution of prevention behaviours among respondents. Analysis of variance shows that significant differences exist across sub-groups of age and educational level ($p < 0.05$). These results point to the earnest need for more efforts to be directed at preventing infections, which should be more focused on the thorny task of changing human behaviours.

Key words: Infection · Perceived severity · Perceived vulnerability · Behaviour · Poultry farm workers

INTRODUCTION

Among the fundamental arguments of protection motivation theory (PMT) is the assertion that the motivation to protect oneself, to engage in adaptive responses (e.g. infection preventive behaviours) is a positive function of beliefs that threat is severe and that one is vulnerable [1,2]. PMT concentrates on cognitive realities in behaviour change [3] and relies on psychosocial mechanisms in the explication of health behaviour [4,5]. The perceived severity of and vulnerability to infection was examined in relation to infection preventive behaviours among poultry farm workers in Ibadan City, Nigeria. Apart from its intuitive appeal, two meta analyses of studies that employed the protection motivation framework [6, 7] have reported significant effect sizes for all protection motivation constructs. "PMT has been found to be a useful model for predicting health-protective intentions and behaviour" [8]. However, threat appraisal, composed of perceived severity and vulnerability, is being agreed as yielding weaker effects on health behaviour [6, 7]. The present study set out to checkout this seeming consensus. The grandeur of PMT makes it likable to employ it in taking a methodical look at infectious diseases.

Infectious diseases arise from the presence of pathogenic agents like bacteria, fungi, virus and protozoa. More than any other single cause, it accounts for deaths all over the world. Pinner *et al.* [9] examined death rate due to infectious diseases in the United States for the years 1980 through 1992 and found this to have increased by 58%. If such is the case, the situation in developing countries is even more pathetic, due to the typical characteristics of its poorer population to being conducive to the evolution of infectious organisms [10]. "Breakdown in public health measures", exemplified by "curtailment or reduction in prevention programs; inadequate sanitation and vector control measures" are among factors in the emergence of infectious diseases [11]. However, this report is hardly concerned about all categories of infectious diseases. It is concerned with those which poultry farm workers are predisposed to. Although "work-related hazards exist in almost all occupations" [12], the poultry farm worker is more susceptible to certain categories of hazards, usually in the form of infections, especially certain food borne zoonoses [13]. These hazards range from minor to major. For instance, "newcastle disease, caused by virulent strains of APMV type 1, may also be responsible for clinical conditions in humans. The virus responsible for

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Newcastle disease has been known to cause conjunctivitis in humans since the 1940s" [14]. Salmonellosis, campylobacteriosis, listeriosis caused by *Salmonella; Campylobacter jejuni and listeria respectively* are among the many fatal infections in which poultry farmers are vulnerable to. Because these pathogens are highly susceptible to gaining entry to the human body, preventive behaviours become paramount. Further, the greater predisposition of tropical regions of the world to the evolution of emerging infectious organisms [10] and the growing world tendency towards animal-based diet rather than plant-based diet, which increases the probability of more food borne zoonotic infections [15] makes this effort rather pertinent. Hence, this study sought among poultry farm workers in Ibadan, Nigeria to elaborate relationship between and among perceived severity of infections (associated with poultry birds), perceived vulnerability to these infections and infection preventive behaviours. It also evaluated the influence of gender, age, education and employment status on respondents' infection preventive behaviours.

Hypotheses:

1. There are significant differences in the scores of infection preventive behaviours across sub-groups of gender, age, education and employment status.
2. There is a positive, significant and strong relationship among infection preventive behaviours, its perceived severity and vulnerability.

Methods: This study is a cross sectional survey of poultry farm workers' in Ibadan. Ibadan is the capital city of Oyo state, in Southwestern Nigeria. Nigeria is situated on the West Coast of Africa between 4 and 14 N° north latitude and between 2 and 15 N° east longitude. It occupies approximately 923,768 total square kilometers (910,768 of land and 13,000 of water). It stretches from the Gulf of Guinea on the Atlantic coast in the south to the border of the Sahara Desert in the north [16]. Nigeria is a federal republic consisting of 36 states and a federal capital territory. According to the 2006 national population and housing census, Nigeria consists of 140,003,542 people (www.nigeriastat.gov.ng). Ibadan as a community was established in the year 1829. Prior to 1970, Ibadan was the largest city in sub-Sahara Africa [17]. This position has since been overtaken due to persistent urbanization in other parts of the continent of Africa. Ibadan ranks third among the largest cities in Nigeria and is the largest in terms of geographical area

(http://en.wikipedia.org/wiki/Ibadan). Ibadan is a Yoruba land and the predominant population is Yoruba people. The Yorubas are largely bilinguals, speaking both English and Yoruba, a conventional and written language.

The poultry farm workers as a sub-set of the population are scattered all over the city. This made it quite difficult to reach the study population. Author's contacts and data obtained from the Oyo State agricultural information management system (http://oyostateagric.org/rpt_LGA_features.php) were used to reach poultry farms/potential respondents. Snowballing was relied on to reach unknown poultry farms and their workers. Thirty-two farms, nine of which tuned down our request for audience were reached during the real study and this produced 173 completed questionnaires, 168 of which were worth analyzing and were eventually used in the final analysis.

Structured questionnaires were used to gather data. These were self administered where respondents were literate enough to complete them. Otherwise, they were administered via structured interviews by trained interviewers. The questionnaire had to be translated to Yoruba language, to meet the needs of respondents that were not proficient enough in English language. Crobach alpha values of 0.623, 0.649 and 0.739 obtained during data analysis are taken as indicators of the reliability of the instrument. The significant correlation between infection preventive behaviour, perceived severity and vulnerability is taken as an indication of the construct validity of the instrument. *Infection preventive behaviour* (IPB), the actions of individuals as regards infection prevention was assessed with a thirteen-item rating scale (responses to each item rated 1-4). A reliability analysis of these items yielded a Crobach alpha value of. 739. Items were scored such that higher score imply better preventive behaviour. The range of possible scores is 13-52. Its *Perceived severity* (PS), the extent of the belief that contactable infections are serious health conditions, was assessed with a four-item rating scale (responses to each item rated 1-4). A reliability analysis of these items yielded a Crobach alpha value of. 623. Items were scored such that higher score imply greater perceived severity. The range of possible scores is 4-16. *Perceived vulnerability* (PV), the extent of the belief that one is vulnerable to, or at risk of contracting infection was assessed with a three-item rating scale (responses to each item rated 1-4). A reliability analysis of these items yielded a Crobach alpha value of. 649. Items were scored such that higher score imply greater perceived vulnerability to infections. The range of possible scores is 3-12. Independent variables

include *gender* (males, females) and *age* (16-25, 26-35, 36-45, 46-55, 56-above). *Educational level,* categorized as low if respondents hold less than a degree, medium if a degree is held and high if anything greater than a degree is attained, is another independent variable. *Employment status* is also an independent variable motivated by the need to ascertain the influence of employment standing on respondents' infection preventive behaviours. It categorized respondents into two: owner-operators and employees. Owner-operators are owners of farms who also work there. Employees are those simply employed to work on the farms.

One sample Kolmogorov Smirnov test (for normalcy) was used to test if infection preventive behaviours, perceived severity and vulnerability to contactable infections data deviate significantly from normal distributions. Results show that the data distributions were not significantly different from normal distributions (*p* > 0.05). Simple percentile analysis was used to assess the demographic profile of the respondents. The index of infection preventive behaviours, perceived severity and vulnerability to contactable infections were computed for each respondent by simply aggregating the scores accorded the items. The distribution of infection preventive behaviours was assessed by categorizing the data into two on the basis of the mean. A descriptive analysis of the scale items was also performed. One way ANOVA was used to assess significant differences in the means across sub-groups of age and educational level. T-test was used to test this difference between gender and employment status sub groups. Levene's test for homogeneity of variance was used to assess the homogeneity of variance across sub groups of all socio-demographic variables, as a prerequisite to the validity of significant differences. Eta and eta^2 were used as measures of effect sizes when significant differences were detected. This depended on the linearity or otherwise of associations between variables. Pearson's correlation coefficient (*r*), multiple R, multiple coefficient of determination (R^2) and beta coefficient (β) were used to elaborate the relationship between and among infection preventive behaviours and perceived severity as well as vulnerability to contactable infections. All data analyses were accomplished with Statistical Package for Social Sciences (SPSS) 15.0 for windows.

RESULTS AND DISCUSSION

Demographic Profiles of Respondents: An overwhelming majority of respondents are males (80.4%), reflecting a male preponderance over females in the poultry farm

Table 1: Profile of Respondents

	Frequency	Percentage
Gender		
Male	135	80.4
Female	33	19.6
Age		
16-25	15	8.9
26-35	93	55.4
36-45	57	33.9
46-55	3	1.8
56-above	0	0
Education		
Low	75	44.7
Medium	78	46.4
High	15	8.9
Employment Status		
Owner-Operator	12	7.1
Employee	156	92.9

category of employment. More than half of the respondents (55.4%) are aged between 26-35. This was followed by the 36-45 age group, who constituted 33.9% of total respondents. Almost half of the respondents possess low and medium educational level (44.6 and 46.4%) respectively. Owner-operators constitute a small fraction of total respondents (7.1%) while employees are in the majority (92.9%). These socio-demographic distributions are presented in Table 1.

Distribution of Infection Preventive Behaviours: The mean behaviour score, 42.75, led to a bipolar distribution of respondents as 51.8% scored below the mean while 48.2% scored above the mean. Those who scored below the mean can be arbitrarily referred to as exhibiting risky infection preventive behaviours. This does not speak well of the predisposition to infections in the study area. But, since this is merely descriptive, conclusion is hardly reached.

Descriptive Analysis of Scale Items: The descriptive analysis of the scale items displayed in Table 2 shows that among the items that assessed the perceive severity of contactable infections, seriousness attracted greater evaluation. Responses to the items that assessed perceived vulnerability to infection are largely similar. With regards to infection preventive behaviours, the use of disposable gloves, use of nose mask, screening for infection as well as eating and drinking around birds attracted lesser evaluation. Yet, the findings of Ramirez *et al.* [18] indicated that respondents who "seldom used gloves…most frequently had evidence of previous H1N1

Table 2: Descriptive analysis of scale items

Scale/Item	Mean	Standard deviation	Minimum	Maximum	Scale alpha
Perceived Severity of Contactable Infections:					
How serious are diseases that can be contacted from birds?	3.25	.894	1	4	.623
[very serious; serious; unserious; very unserious]					
To what extent do you think they can cause human death?					
[very large extent; large extent; small extent; very small extent]	2.71	1.050	1	4	
Diseases that can be contacted from birds are simple, everyday ailments.					
[strongly agree; agree; disagree; strongly disagree]	2.52	1.072	1	4	
Among the most dangerous diseases are diseases that are spread by birds					
[strongly agree; agree; disagree; strongly disagree]	2.52	1.072	1	4	
Perceived Vulnerability to Contactable Infections:					
How worried are you that you may contact disease from birds?					
[highly worried; worried; not worried; highly unworried]	2.68	1.057	1	4	.649
To what extent do you think you can contact diseases from birds?					
[very large extent; large extent; small extent; very small extent]	2.38	1.048	1	4	
"I cannot contact diseases from animal/birds"					
[strongly agree; agree; disagree; strongly disagree]	2.666	1.060	1	4	
Infection Preventive Behaviours:					
How often do you vaccinate your birds? [very often; often; rarely; not at all]	3.50	.758	1	4	.739
To what extent do you adhere to vaccination procedures?					
[very large extent; large extent; small extent; very small extent]	3.57	.778	1	4	
How will you describe the adequacy of your vaccinations?					
[very adequate; adequate; inadequate; very inadequate]	3.59	.678	1	4	
How often do you disinfect your farm?					
[very often; often; rarely; not at all]	3.68	.540	2	4	
To what extent do you think your disinfections are adequate?					
[very adequate; adequate; inadequate; very inadequate]	3.50	.569	2	4	
How often do you use disposable gloves?					
[very often; often; rarely; not at all]	2.82	1.074	1	4	
How often do you use protective foot wear e.g. booth?					
[very often; often; rarely; not at all]	3.61	.675	1	4	
How often do you use nose mask?					
[very often; often; rarely; not at all]	2.73	1.080	1	4	
How often do you use protective wear e.g. lab coat?					
[very often; often; rarely; not at all]	3.34	.990	1	4	
How does your farm implement screening programme(e.g. periodic blood test, mucosal examination, urine analysis) for personal health?					
[not at all; poor; fair; good]	2.66	1.247	1	4	
To what extent do you eat and drink in places around your birds/animals?					
[very large extent; large extent; small extent; very small extent]	2.91	1.093	1	4	
How often do you keep ill animals away from others?					
[very often; often; rarely; not at all]	3.29	1.084	1	4	
How often do you wash your hands on the farm?					
[very often; often; rarely; not at all]	3.55	.681	1	4	

swine virus". Screening for infection is the least. Disinfection of farms attracted the highest evaluation. This was closely followed by the use of protective foot wear. Adherence to vaccination procedures and regularity of hand washing are among the preventive behaviours that are highly exhibited. Since finance i.e. purchasing, is involved in many of these preventive procedures, it is unanticipated that some procedures are not regularly exhibited. However, these differences are slight and quite negligible. Nevertheless, screening for infections need to be more encouraged in the study area. The descriptive analysis of the scale items is presented in Table 2.

Hypothesis 1a: There are significant differences in the scores of infection preventive behaviours between sub-groups of gender.

The assessment of the influence of gender on infection preventive behaviours indicate that males exhibit slightly better behaviours (mean = 42.8) than females (mean = 42.4) but this difference was insignificant ($p > 0.05$). Therefore, the hypothesis of gendered differences in preventive behaviours is rejected.

Hypothesis 1b: There are significant differences in the scores of infection preventive behaviours among sub-groups of age.

The 36-45 age group exhibit the best infection preventive behaviours (mean = 45), followed by the 26-35 age group (mean = 41.9) and the 16-25 age group (mean = 40.8). However, the 46-55 age group exhibit the worst infection preventive behaviours (mean = 34) and these differences was significant ($p < 0.05$). Hence, the hypothesis of age differences in preventive behaviours is accepted. Levene's test endorse these differences ($p > 0.05$) as it reveal sub group's homogeneity of variance. It is interesting to find that infection preventive behaviours advances with age, reaches a peak and then decline. This is the scenario that this result depicts which is probably due to decreasing energy to engage in preventive behaviours. Otherwise, there may exist a sense of taking things for granted. Repeated preventive behaviours might become boring over time. This can surely be a point for further research. Such effort can aim at assessing the rise and fall of preventive behaviours over the life course. The association between age and infection preventive behaviours is non linear ($p <. 05$). Eta is 0.358 and eta^2 is 0.128. Therefore, about 12.8% of the variation in infection preventive behaviours is explained by age.

Hypothesis 1c: There are significant differences in the scores of infection preventive behaviours among sub-groups of educational level.

Respondents who possess high educational level exhibit the best infection preventive behaviours (mean = 46.2), followed by those with low educational level (mean = 43). Those with medium educational level exhibit the worst infection preventive behaviours (mean = 41.8). This difference is significant ($p < 0.05$). Hence, the hypothesis of educational differences in preventive behaviours is accepted. The result of Levene's

test endorse this difference ($p > 0.05$) as it attest to sub group's homogeneity of variance. It is intuitive to find that respondents with high educational level exhibit the highest preventive behaviours. But, it is counter intuitive to find that those with low educational level exhibit better infection preventive behaviours than those whose educational level is medium. This may reflect the influence of other variables aside education. Further, encouragement and monitoring of preventive behaviours by larger farms could have been more centered on people with low educational level. Monitoring will most likely be undertaken by individuals with high educational level, predisposing highly educated workers to better infection preventive behaviours. This need to be further researched. The association between education and infection preventive behaviours is non linear ($p < 0.05$). The values of Eta and eta^2 are 0.224 and 0.050 respectively. This shows that just about 5% of the variation in infection preventive behaviours is accounted by education.

Hypothesis 1d: There are significant differences in the scores of infection preventive behaviours between sub groups of employment status.

Employee's infection preventive behaviours was largely better (mean = 43.1) than owner-operator's (mean = 38). This difference is insignificant ($p > 0.05$) [equal variances not assumed, as Levene's test indicate sub group's heterogeneity of variance ($p < 0.05$)]. Therefore, the hypothesis of employment status differences in preventive behaviours is rejected. These mean values are counter intuitive as one will ordinarily expect better infection preventive behaviours among individuals who own and work on their farms. This contradiction to expectation may depict a methodological limitation of the study. It is possible that some owner-operators responded to the questionnaires in order not to look "unserious" before strangers who have come to ask about how they do their work. It is possible that some owner-operators are simply managers and do not regularly participate in the routine activities on the farm. Otherwise, this contradiction to expectation could be explained by work related dynamics which this present effort is not equipped to diagnose. This finding should be of interest to those in the field of industrial and personnel relations. The summary of result of bivariate testing of significant differences is presented in Table 3.

Table 3: Summary of the result of bivariate assessment of significant differences

	Infection Preventive Behaviours
Gender	Insignificant:
	T-test = 0.0524
Age	Significant:
	ANOVA = 0.001
	Levene's test= 0.052
	Non-linearity= 0.000
	Eta= 0.358
	Eta²= 0.128
Educational	Significant:
Qualification	ANOVA= 0.014
	Levene's test= 0.561
	Non-linearity= 0.005
	Eta= 0.224
	Eta²= 0.050
Employment	Insignificant:
Status	T-test= 0.060
	Levene's test= 0.012

Table 4: Summary of bivariate elaboration of relationships

	Infection Preventive Behaviours
Perceived	$r = 0.324$**
Severity	$\beta = 0.295$**
Perceived	$r = 0.201$**
Vulnerability	$\beta = 0.067$**

**$p<0.05$

Table 5: Summary of result of multivariate analysis of relationship

Model:	
Infection Preventive Behaviours	
and	R= 0.329**
Perceived Severity of Contactable Infections	R²= 0.108**
Perceived Vulnerability to Contactable Infections	

**$p<0.05$

Hypothesis 2: There is a positive, significant and strong relationship between and among infection preventive behaviours and perceived severity as well as vulnerability to contactable infections.

The assessment of the bivariate relationship between infection preventive behaviours and perceived severity yield,ed a Pearson's r of 0.324 ($p < 0.05$) and a standardized beta coefficient (β) of 0.295 ($p < 0.05$). A similar assessment between infection preventive behaviours and perceived vulnerability yielded a Pearson's r of 0.201 ($p < 0.05$) and a standardized beta coefficient (β) of 0.067 ($p < 0.05$). To a large extent, these findings support the "seeming consensus" in the literature which nods in the direction that threat appraisal variables yield weak effect sizes on behaviour. The meta analysis as reported by Floyd *et al.* [6] indicated that severity yielded an estimate of effect size value of 0.39 ($p < 0.05$) on intention and behaviour while vulnerability yielded an estimate of effect size value of 0.41 ($p < 0.05$) on intention and behaviour. It is noteworthy though that Floyd *et al.* [6] reported d₊ (sample weighted standardized mean differences), rather than Pearson's r and β that is being reported. Milne *et al.* [7] also reported that severity yielded an estimate of effect size value of 0.10 ($p < 0.05$) on concurrent behaviour while vulnerability yielded an estimate of effect size value of 0.13 ($p < 0.05$) on concurrent behaviour, though they reported r₊ (sample weighted average correlations). Apart from the fact that the values reported in this study are not as strong as those reported by Floyd *et al.* [6], perceived vulnerability has been found to possess a better relationship with both intention and behaviour as well as on concurrent behaviour when compared with severity [6,7]. However, this study demonstrates that severity is more important to health behaviour than vulnerability. The dynamics of idiosyncratic elements probably account for this disparity as different sorts of health behaviours were considered in the meta analyses aforementioned. Although infection prevention is also a sort of health behaviour, it has to do with work-related behaviours which also centered on a work category. The role of contextual differences cannot be entirely ruled out. The parities that are recorded here include the fact that both severity and vulnerability hold significant correlation with health behaviour. They also have weak effects on health behaviour. The summary of result of bivariate elaboration of relationships is presented in Table 4. Multivariate analysis of infection preventive behaviours on one hand and perceived severity of and vulnerability to contactable infections yielded a multiple R of 0.329 ($p < 0.05$) and a R^2 of 0.108 ($p < 0.05$). This shows that only 10.8% of the variation in infection preventive behaviours is accounted for by both perceived severity of and vulnerability to contactable infections. This largely confirms our hypothesis. The relationships are both positive and significant. However, they are not very strong. The summary of result of multivariate analysis is presented in Table 5.

CONCLUSION

There is an earnest need to prevent infections especially among workers in the agricultural sector. Agriculture predisposes significant risk for the development of infection [19]. A good majority of livestock farm workers exhibit what is arbitrarily described as unhealthy infection preventive behaviours. Food borne zoonoses as a disease category are especially

important for their propensity to cause significant loss on the income of poultry farmers and also lead to significant health impairment. They must surely be fixed up at the crossing point of animal and human health while taking advantage of all available information [20]. Since human behaviour has been largely implicated in the aetiology of these diseases, the thorny task of changing human behaviour remain central in the effort to prevent infections in general. As a corollary to this, health education remains a primary preventive measure [21, 22, 23]. 'Health' education is indeed pivotal. The relevance of general education in the sustenance of protective health behaviour was a little threatened by the findings of this effort. Although a significant association was recorded between educational qualification and infection preventive behaviours, these behaviours do not necessarily increase with education. Since infectious diseases have similar preventive procedures (e.g. hand washing and use of nose mask), general health education should be able to have the desirable impact. Interest in healthy lifestyle could and should be continually packaged with health education. Interest in healthy lifestyle has been reported as strongly correlating with toxoplasma-related correct behaviours [24]. Further, surveillance for infection is of high relevance [18, 25 and 26]. Surveillance appears to be even more necessary for this study's target population as screening for infection among livestock farm workers was found to be least exhibited, among other preventive behaviours. In addition, recent interests in physicians' role in zoonotic infection [27, 15] demonstrate the possible role that physicians can play in stemming the tide of zoonoses.

A seeming consensus in the literature ascribing significant but weaker effects to threat appraisal variables in the protection motivation theory is largely confirmed in this study. Hence, threat appraisal is relevant in diagnosing health behaviours but will do better if used in conjunction with other independent variables.

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